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# **CHARTER**

OF THE

**SANDY AND BEAVER**

**CANAL COMPANY;**

AND

**REPORTS**

OF

**ENGINEERS.**

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***New-Lisbon, O.***

PRINTED BY JOSEPH CABLE.

**NOVEMBER—1834.**

# CONTRACT CASE

THE STATE OF PENNSYLVANIA  
COUNTY OF [illegible]  
IN SENATE  
January 1, 1900  
REPORT OF THE  
COMMISSIONER OF THE  
DEPARTMENT OF  
TREASURY  
IN RESPONSE TO A  
RESOLUTION PASSED  
BY THE SENATE  
MAY 1, 1899  
RELATIVE TO THE  
ACCOUNTS OF THE  
TREASURER OF THE  
COMMONWEALTH

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## REPORT OF THE COMMISSIONER OF THE DEPARTMENT OF TREASURY

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RESOLUTION PASSED  
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RELATIVE TO THE  
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# CHARTER

OF THE

FREE AND ANCIENT

TOWNSHIP OF

ST. JOHN

IN THE

PROVINCE OF

NEW BRUNSWICK

AND

THE

COUNTY OF

ST. JOHN



*Office of the Sandy and Beaver Canal Company, }  
New-Lisbon, October 14th, 1834.*

The succeeding pages contain the charter of the Sandy and Beaver Canal Company and amendments, the Report of Maj. Douglass who examined the proposed Canal route in 1828, the instructions of the Board of Directors to Messrs. Gill and Hage, civil engineers, the Report of those gentlemen recently made to the Board and the testimonials of their professional reputation and capacity. An early communication between the Pennsylvania and Ohio Canals is a subject of great and growing interest. The approaching completion of the improvements between the cities of Philadelphia and Pittsburg, and the rapid and unexpected developement of business on that line are daily demonstrating the great importance and pressing necessity of an extended communication with the productive regions of the west. The motive which influences the Board in directing the present publication, is to exhibit to the public, in convenient form and in one connected view, the important facilities which the route for the Sandy and Beaver Canal affords for effecting the desired connection, and the flattering inducements which the chartered privileges of the Company present to the investment of capital. The original Charter was considered liberal in its provisions, but the recent munificent grant of the legislature of Ohio, is believed to be unexampled in liberality. That grant, which will be found in the amendatory Act of 1834, must render this stock in a high degree productive; more so, perhaps, than that of any Canal Company in the Union. The Report of Major Douglass presents a minute and detailed estimate of the expense of construction and an accurate statement of the course and distance of the Route, but does not exhibit all the available resources for the supply of the summit with water. At the time that Report was made, strong prejudices on the score of health existed in the minds of persons residing on the summit, against the construction of reservoirs. The engineer believing that an adequate supply could be obtained without a resort to them, omitted to embrace in his Report, any estimate of the supply that could be derived from that source. That unfortunate, but blame-



less omission, caused the suggestion of doubts as to the available supply of water on the summit. These suggestions emanating from interested sources, and obtaining extensive circulation, caused a wide spread belief among those who were unacquainted with the location of the line, the facilities for constructing reservoirs and the peculiar nature of the soil on the summit, that the supply of water was inadequate to meet the exigencies of an active and extensive commerce.— That belief received, during the last autumn, a very imposing and influential sanction from high, but as the event has proven, mistaken authority. The Directors residing on the line, and intimately acquainted with the country, entertained no doubts that an abundant supply of water could be obtained: but the interests of the Company and the voice of the stockholders required that all doubts should be removed from the public mind. Two engineers were employed to make a full, minute and thorough examination of the summit, and test the question of supply. They were recommended to the Board by high authority in Philadelphia and Harrisburg. The evidences of their reputation, experience and capacity will be found at the close of this publication.

The Board can bear testimony that their examination was made during a period of unexampled drought. Their Report is now submitted to the public. It is perfectly satisfactory to the Board and Stockholders, and is, as the Board conceive, entirely conclusive as to the question of an abundant supply of water to meet all the demands of the most extensive commerce.

Nearly \$200,000 of stock have been subscribed along the line, and the first instalment has been promptly paid. The Board in obedience to the will of the Stockholders, have resolved to put a portion of the line under contract and commence the work during the present season, with a fixed determination to persevere until its completion.— Arrangements have been made for opening books for the subscription of stock in Pittsburg and Philadelphia, and the Board earnestly invite the attention of the citizens of those places to the following Charter and Reports, and respectfully solicit their aid, by the liberal subscription of Stock, in the early completion of a project which promises generous returns to the capitalist, and inestimable benefits to the public.

BENJAMIN HANNA, *President,*

CHARLES D. HOSTETTER, *Secretary,*

# AN ACT

## To incorporate the Sandy & Beaver Canal Company.

SEC. 1. Be it enacted by the general assembly of the state of Ohio, That Benjamin Hanna, David Begges, Horace Potter, Geo. M'Cook, James Robertson, Joseph Richardson,\* and Elderkin Potter of Columbiana county; Christian Deardoff and Henry Laffer of Tuscarawas county; William Christmas, William Henry, William Reynolds and Jacob Hostetter of Stark county; and their associates and successors be and they are hereby constituted and made a body politic and corporate, and shall be and remain a corporation forever, under the name of "The Sandy and Beaver Canal Company," and by that name may sue and prosecute, and be sued and prosecuted to final judgment and and execution, in all courts having competent jurisdiction, and may have a common seal, and the same alter and renew at pleasure, and shall be and hereby are vested with all the powers and privileges which are by law incident to corporations of a similar nature, and which may be necessary to carry into effect the objects of this corporation.

SEC. 2. That the said corporation be and they are hereby authorized to locate, make, construct, and forever maintain a navigable canal with all necessary locks, towing paths, basins, aqueducts, culverts, waste-wiers, dams, wharves, embankments, toll-houses and

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\* A. W. Loomis is appointed commissioner in the place of Joseph Richardson, deceased, and John Shorb, do. in the place of William Reynolds, deceased, by the legislature.



other necessary appendages, commencing at a suitable point on the Ohio canal, at or near the mouth of Big Sandy creek, thence to the waters of the middle fork of Little Beaver creek, at or near the town of New Lisbon, in Columbiana county, and thence to the eastern boundary of the state of Ohio, at or near the mouth of Little Beaver Creek, with further power to employ and use as reservoirs or feeders, for the purpose of supplying with water, said canal or such works as may have any portion of their waters diverted from them, to supply said canal, the different ponds, rivers and streams of water near or over which said canal may pass, and also to save the flood and other waters in said ponds, rivers and streams so used as aforesaid, and construct artificial reservoirs for the purposes aforesaid, and the said corporation shall have power to connect with said canal, by feeders or by navigable canals any or all of said ponds, rivers, streams and reservoirs.

SEC. 3. That for the purpose of assuring to said corporation all the lands, real estate, waters and materials requisite for most economically constructing and maintaining said canal, and the waters connected therewith and incident and necessary to the navigation of the same, whenever the said lands, waters and materials shall not be obtained by voluntary donation, or fair purchase, it shall be lawful for said corporation by any of their officers and by each and every agent, superintendant or engineer by them employed, to enter upon, take possession of, and use all such lands, real estate, and streams as shall be necessary for the purpose aforesaid, and also to enter upon and take all necessary materials for the construction of said canal, and other works connected therewith, adjoining or near said canal, or other works on whose lands soever the same may be, doing thereby no unnecessary damages, they satisfying and paying all damages which may be occasioned thereby to any person or persons, corporation or corporations in the manner hereinafter provided.

SEC. 4. That if at any time after said canal or any of its branches or feeders are located, any unforeseen obstacles, impediments or inconveniences occur on the route located, the said corporation shall have power to deviate from said route so far and in such manner



as may be best calculated to surmount, overcome or avoid such obstacles or inconveniences, said corporation satisfying all damages which may be occasioned thereby, in the manner hereinafter provided, and said corporation may from time to time make such alterations in the course of said canal, its branches and feeders as may be necessary or expedient, satisfying all damages in manner aforesaid.

SEC. 5. That said corporation be and hereby are authorized and empowered to purchase and hold to them and their successors forever, real and personal estate to any amount necessary for constructing, maintaining and repairing said canal and the works connected therewith as aforesaid, and may receive, hold and take all voluntary grants and donations of lands and real estate which shall be made to aid the objects of said corporation, and may also erect mills and other hydraulic works on the waters connected with said canals, feeders and reservoirs, and whenever in either of the ways aforesaid, said corporation shall become possessed of and own any lands or real estate which it may be unnecessary for them to retain for the purposes aforesaid, it shall be lawful for them to lease, occupy, alien and convey the same by lease or deed with their seal affixed thereto.— Provided, however, That all lands and waters belonging to said corporation necessary for the navigation of said canal, and for maintaining and repairing the same and the works connected therewith as aforesaid, shall be held by said corporation and applied to and for the aforesaid purposes.

SEC. 6. That a toll be and hereby is granted and established for the sole benefit of said corporation forever, and it shall be lawful for said corporation from time to time, to fix, regulate and receive the tolls and charges by them to be received for the transportation of property or persons on the canals authorized by this act: Provided, That the nett proceeds of the tolls and charges thus fixed, regulated and received by said corporation shall at no time exceed twenty per centum annually on the capital stock of said company, or the highest rate of tolls and duties together with their charges of freight, to which property of a similar kind is subjected, as the cost of transportation on the Ohio canal during the same period of time.



SEC. 7. That the president and directors of said corporation shall have power from time to time to make and ordain such by-laws, rules and regulations as may be necessary, touching the premises, especially to fix upon and determine the size and form of boats, rafts, and all other vessels that shall be used for the purpose of navigating said canal or any of its branches, to determine the time and manner of their passing the locks and what commodities shall not be transported during a want of water, should such an event happen on any portion of said canal: Provided the same be not repugnant to the constitution and laws of this state or of the United States; and the penalties imposed by said by-laws, rules and regulations may be sued for and recovered by the treasurer of said corporation, or by any other person, thereunto by said corporation authorized, to their own use and benefit, before any court having competent jurisdiction, which penalties shall in no case exceed the sum of ten dollars. And said corporation shall cause said by-laws, to the breach of which penalties are affixed, to be printed, and a copy thereof to be placed in some conspicuous situation at each toll house, and if any person or persons shall wilfully or maliciously mar, deface or pull down any copy so set up, said corporation may sue for and recover to their own use a sum not exceeding ten dollars, nor less than five dollars of any such person or persons.

SEC. 8. That if any person or persons shall wilfully obstruct the water navigation, remove or in any way spoil, injure or destroy said canal or its branches, feeders or reservoirs or any part thereof, or any thing belonging thereto, or any materials to be used in the construction or repairs thereof, such person or persons (or any person or persons assisting, aiding or abetting in such trespass) shall forfeit and pay to the said corporation, treble the amount of damages sustained by means of such offence or injury to be sued for and recovered with costs of suit in an action of debt in any court having competent jurisdiction, by the treasurer of said corporation or by any person thereunto by said corporation authorized.

SEC. 9. That whenever any lands, waters, streams or materials shall be taken and appropriated by said corporation for the location



or construction of said canal or any of its branches feeders or appendages, or any work or device appertaining thereto, and the same shall not be given or granted to said corporation, and the proprietor or proprietors do not agree with said corporation as to the amount of damages or compensation which ought to be allowed and paid therefor, and shall not mutually agree on some person or persons to appraise the same, the damages shall be estimated and assessed by three commissioners, to be appointed by the court of common pleas for the county in which the damages complained of are sustained, in manner following: Whenever said corporation shall have located said canal or any part thereof, or any of its branches, feeders or reservoirs, and shall have put the same under contract, or shall have used or appropriated any waters, streams or materials for the construction thereof, any person or persons, corporation or corporations, injured thereby, may at any time within six months thereafter, file his, her or their claim for damages in writing, particularly describing the premises, with some one of said commissioners or with the clerk of the court of common pleas, for the county in which the damages complained of are sustained; and said commissioners or any two of them, having been first duly sworn to a faithful and impartial discharge of their duties, within a reasonable time thereafter, (they themselves having had notice from the claimant, in case the claim is lodged with the clerk of the court of common pleas, that such claim has been there filed,) having given previous notice to all parties interested, of the time and of the claims to be examined, by publishing an advertisement thereof three successive weeks in some newspaper printed in said county, or in general circulation therein, in case none should be printed in the county, shall meet and pass over the premises so used or appropriated by said corporation, for the purposes aforesaid; and after hearing the parties in interest or such of them as desire to be heard, shall according to the best of their skill and judgment, estimate all such damages as they shall think any person or persons, corporation or corporations have sustained or will sustain by the opening of said canal or any of its branches or feeders, through his, her or their lands, or by the construction of any reservoirs, embankments,

towing paths, basins, wharves or other appendages, or for any materials used in the construction thereof, or from the diversion of the the water from any of the ponds, rivers or streams, herein before mentioned, over and above the benefit and advantage which said commissioners shall adjudge may accrue to such person or persons, corporation or corporations, from opening said canal; and the said commissioners or any two of them shall make a report in writing, and as soon as may be, file the same with the clerk of the court of common pleas for said county, and the same may be made a rule of said court, at the next succeeding or any subsequent term thereof, as in the case of awards; and the report of said commissioners, when affirmed and recorded, shall forever be a bar to any action commenced or to be commenced for damages against said corporation, on account of the injury for which such damages were awarded; and if the party filing a claim for damages as aforesaid, shall fail to obtain damages in his favor, such party shall be liable for all costs arising from such application, and the court may enter judgment and issue execution therefor as in other cases; and on all judgments against said corporation, for damages assessed as aforesaid, or for the costs thereof, execution may issue in the common form, *mutatis mutandis*, and may be levied on the goods and chattels, lands and tenements of said corporation; and said commissioners shall be allowed three dollars a day, each, for their services, under the provisions of this act, to be paid by said corporation, except as herein before provided.

SEC. 10. That it shall be the duty of said corporation to make and construct said canal, with good and sufficient locks and also, to build and keep in good repair, suitable and convenient bridges over said canal, in all places where said canal shall pass any existing state or county road, which at the time shall be opened and used as such; and said canal and the works to be erected thereon, in virtue of this act, when completed, shall forever thereafter be esteemed and taken to be navigable as a public highway, free for the transportation of all goods, commodities and produce whatever, (except such as may be inhibited during a scarcity of water, as provided for in the



seventh section of this act,) on payment of the tolls to be imposed, as provided by this act, and no other toll or tax whatever for the use of said canal and the works thereon erected, shall at any time hereafter be imposed, but by consent of the state of Ohio.

SEC. 11. That in all cases where any road or public highway is so located that said canal or any of its tributaries, cannot be judiciously laid out and made, without interfering therewith, it shall be lawful for said corporation to cause such road or highway to be so altered as that said canal and other works may be laid out and constructed on the most advantageous site of ground. *Provided*, That said corporation shall cause such road or highway, thus altered, to be put in as good repair as the old one was at the time of removing the same, at their own cost and expense, and before shutting up or obstructing said highway.

SEC. 12. That if after the location and construction of said canal as aforesaid, any alterations shall be made in the course thereof, or in the course of its feeders or branches, or if any new reservoirs, branches or feeders, shall be made in aid of said canal, the damages may be estimated in the same way, and the same proceedings may be had, in manner provided in this act: *Provided*, however, That in all cases it shall be competent for said company and any person or persons, corporation or corporations, injured by the location or construction of said canal or any of its tributaries or appendages, to submit the question of damages to such arbitrators as they may agree upon, whose award, when made and returned to the court of common pleas, within and for the county wherein the damages have been sustained, and affirmed by said court, shall be final, and said court may enter judgment accordingly.

SEC. 13. That the said corporation shall be, and is hereby authorized to raise sufficient funds for the accomplishment of the objects aforesaid; and for that purpose, the persons named in the first section of this act, or a majority of them, shall be commissioners, whose duty it shall be, so soon after the taking effect of this act, as a majority of them shall judge proper, to cause books to be opened at such times and places as they shall think fit, under the management

of such persons as they shall appoint, for receiving subscriptions to the capital stock of said company, each share to be of the amount of one hundred dollars, and each subscriber to be a member of said corporation, for all purposes; and public notice shall be given in such manner as may be deemed advisable by said commissioners, of the times and places of opening said books; and the said commissioners, or a majority of them, may prescribe the form of said subscription, and whenever the sum of three hundred thousand dollars, or a greater part of the stock of said company, shall have been subscribed, it shall be the duty of said commissioners, or a majority of them, to call a meeting of the stockholders, by causing notice to be published in one or more newspapers in general circulation in the respective places in which the books shall have been opened and stock subscribed, at least twenty days previous thereto, of the time and place of such meeting, which shall be at some convenient town, or place near the route of the contemplated canal; at which meeting the stockholders, who shall attend for that purpose, either in person or by lawful proxy, shall elect by ballot seven directors, who shall hold their offices until the expiration of one year, and until others shall be chosen in their places; and the said commissioners shall be inspectors of the first election of directors of the said corporation, and shall certify under their hands, the names of those duly elected, and shall deliver over to them the said certificates and subscription books; and at said election, and at all other elections or voting of any description, every member shall have a right to vote by himself or proxy duly authorized in writing, and each share shall entitle the holder to one vote; and that the management of the concerns of the said corporation, shall be entrusted to seven directors, to be elected annually by the stockholders, by ballot; and that the directors first chosen, and such directors as shall thereafter be chosen, at any subsequent election, shall immediately thereafter meet and elect one of their number, who shall be president thereof, until another election, and, also, to elect a treasurer and secretary, who may be removed at the pleasure of the said president and directors, and others elected in their places; and that a majority of said directors shall constitute a board, for every purpose within the provisions of this act.



SEC. 14. That in case it should at any time happen that the election of directors shall not be held on any day when, pursuant to this act, it ought to be held, the said corporation shall not, for that cause, be deemed to be dissolved, but such election may be held at any other time directed by the by-laws of said corporation.

SEC. 15. That the books of subscription shall remain open as long as the president and directors shall see fit; and each subscriber shall be bound to pay, from time to time, such instalments on his stock as the said president and directors may lawfully require, they giving at least thirty days previous notice of the time and place of making the payments required, in at least one newspaper in general circulation in each of the counties through which said canal may pass; but no assessment shall ever be made so as to render any subscriber liable to pay more than one hundred dollars for a share; if, however, after the closing of said books, or at any time, it shall appear that sufficient funds have not been raised, the president and directors of said company, as its officers duly authorized for that purpose, may at any time, and from time to time, raise the necessary funds by creating and selling additional shares, in such manner and upon such terms as the president and directors shall prescribe; and the holders of such additional shares shall thence forward be members of said corporation for all purposes.

SEC. 16. That if any subscriber shall neglect to pay his subscription, or any portion thereof, for the space of thirty days after he is required so to do, by the said president and directors, notice having been given as required in this act, the treasurer of said corporation, or other officer duly authorized for that purpose, may make sale of such share or shares at public auction to the highest bidder, giving at least thirty days previous notice thereof, in some newspaper in general circulation at the place of sale; and the same shall be transferred by the treasurer, in the manner hereinafter provided, to the purchaser; and such delinquent subscriber shall be held accountable to the corporation for the balance, if his share or shares shall be sold for less than the amount remaining due thereon, and shall be en-

titled to the overplus, if the same shall be sold for more than the amount so remaining due, after deducting the costs of sale.

SEC. 17. That the stock of said corporation shall be considered and deemed real estate; and any share or shares of any stockholder may be transferred by deed duly acknowledged and recorded by the clerk of said corporation, in a book to be kept for that purpose; which book or books shall at all reasonable times, during the usual hours of transacting business, be open to the examination of any person having in his possession any demand against said company; and the treasurer is hereby authorized to make transfers, in like manner, of the shares of members, sold according to the provisions of the last preceding section of this act.

SEC. 18. That when the land, or other property or estate, belonging to any infant, feme covert, or person non compos mentis, shall be taken and appropriated for the use and purpose of said canal as aforesaid, the husband of such feme covert, and the guardian of such infant or person non compos mentis, respectively, may execute any deeds, enter into any contracts, or do any other matter or thing, respecting such lands or other estate, to be taken and appropriated as aforesaid, as they might do if the same were by them holden in their own rights respectively.

SEC. 19. That for and in consideration of the expenses the said corporation will be at in constructing said canal, and other works connected therewith as aforesaid, and in improving and keeping the same in repair, the said canal and all other works aforesaid, together with tolls, rents and profits arising therefrom, shall be, and the same are hereby vested in the said corporation: *Provided*, That the state shall have the power, at any time after the expiration of fifty years from the time of the completion of said canal, to purchase and hold the same for the use of said state, by paying to the said corporation therefor the amount expended by them in locating and constructing the same, together with fifteen per centum thereon.

SEC. 20. That the said corporation shall be entitled to the benefit of all laws which are or shall be in force for the collection of tolls, or for the protection of any canals constructed by this state, as far



as such law or laws shall be necessary to ensure the collection of tolls or for the protection of the canals and other property which the said corporation may lawfully hold within the limits of this state, in order more fully to carry into effect the provisions of this act; and in any suit instituted against the said corporation, the service of legal process on the president, any one of the directors, or on the treasurer or secretary of said corporation, shall be deemed and held, in all courts and places, a sufficient and valid service on the said corporation.

SEC. 21. That when the said canal, and other works connected therewith, shall be completed, the president and directors of said company shall make out a minute, full and detailed statement in writing, of the expenses incurred by the said corporation, in locating and constructing said canal and other works aforesaid; which report shall be made under oath of the president, and shall be by him filed in the secretary's office of this state; and, if after the completion of said canal as aforesaid, any alterations shall be made in the course thereof, or in the course of any of its feeders or branches, or if any new reservoirs, branches or feeders shall be made in aid of said canal, the said president and directors shall, in like manner, from time to time, make out and file statements of the expenses incurred by such alterations or additional works as aforesaid.

SEC. 22. That it shall and may be lawful for any corporation, or state, or for the government of the United States, to subscribe for any number of shares of stock in said company, upon the same terms as other subscribers are authorized to take and subscribe for the same.

SEC. 23. That this act shall be deemed a public act, and shall be benignly and favorably construed for the purposes therein expressed and declared, in all courts and places whatsoever.

SEC. 24. That this act shall not be so construed as to vest any banking powers, or any other powers in said corporation, not necessary to promote the object herein specified.

SEC. 25. That if the corporation hereby created, shall not within twelve years from the time of the taking effect of this act, construct,

finish and put in operation the canal hereby contemplated, or if after the completion thereof they shall fail for twelve months at any one time to keep the same in repair, then or in either case the said corporation shall thenceforth cease and their charter be forfeited.

EDWARD KING,

*Speaker of the House of Representatives.*

SAMUEL WHEELER,

*Speaker of the Senate.*

January 11, 1828.

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[The following is an Act, amendatory to an Act, entitled "An Act to incorporate the Sandy and Beaver Canal Company."]

SEC. 1. Be it enacted by the General Assembly of the State of Ohio, That whenever the sum of one hundred and fifty thousand dollars of the stock of the Sandy and Beaver Canal Company shall have been subscribed, it shall be the duty of the commissioners named in the first section of the act, entitled an act to incorporate the Sandy and Beaver Canal Company, passed January 11, 1828, and the act amendatory thereto, or a majority of them to call a meeting of the stockholders for the purpose of organizing said company in the manner pointed out in said act.

SEC. 2. That the said company shall be allowed twenty years from the passage of the act incorporating said company to complete said canal, any thing in said act to the contrary notwithstanding.

SEC. 3. That when the canal authorized to be constructed by the act entitled an act to incorporate the Sandy and Beaver canal company, shall have been completed twenty miles from the Ohio canal, said company shall be entitled to collect and receive the tolls accruing on the Ohio canal, on all freight and passengers that may be transported thereon, and which have been transported not less than twenty miles on said Sandy and Beaver canal to the Ohio canal, and to receive the toll on all freight and passengers that may be transported thereon, and discharged and landed in said Sandy and Beaver



canal, at any point not less than twenty miles from the Ohio canal, for the term of seven years from and after the completion of the twenty miles of canal aforesaid.

SEC. 4. The tolls hereby granted to said canal company for the term aforesaid, shall be ascertained and paid over to said company in such manner and at such time as the board of canal commissioners may prescribe and direct, or in such manner as may be directed by law:

JOHN H. KEITH,  
*Speaker of the House of Representatives*  
 DAVID T. DISNEY,  
*Speaker of the Senate.*

March 3d, 1834.

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## REPORT

### OF MAJOR D. B. DOUGLASS

### ON THE SANDY AND BEAVER CANAL.

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TO MESSRS. POTTER, BEGGES, HANNA, AND OTHERS,  
 COMMISSIONERS OF THE SANDY AND BEAVER CANAL.

GENTLEMEN:—From the notes and observations made along the line of the Sandy and Beaver Canal by myself in 1828, together with the surveys and measurements more recently furnished me by the resident engineer, I have completed the calculations and estimates for said canal, and have now the honor to communicate the results in the following report.

For convenience of reference, the line is divided into three natural subdivisions, called respectively, the Middle, Western and Eastern divisions, which I shall describe in the order in which I have named them.

The middle division corresponds precisely with the summit level of the canal and of course occupies the dividing ground between the waters of the Little Beaver and the heads of the Sandy. It is fourteen miles in length, commencing on the high ground about a mile and a half west of New-Lisbon, and terminating in the valley of the Sandy, two miles below Hanover. The first part of its course, for about six miles, passes through grounds generally favorable, being level, easy of excavation, and of an uncommonly fine soil for retaining water. Two slight extra cuttings, of about a third of a mile each, and average depth of 12 feet, are the only particulars that deserve to be excepted from this remark. Another portion of about four miles in length, winds among the head waters of the West Fork of Little Beaver, and is somewhat more undulating than the preceding. Two deep cuttings occur upon it, of which the most considerable is 56 chains long by 36 feet average depth; the other is also about 30 feet deep at an average, but only 15 chains long.—With these exceptions, there is nothing particularly unfavorable; and, upon the whole, the better kind of ground greatly predominates. A third portion of this division, about two miles in length, intersects the principal dividing ridge and reaches the head waters of the Sandy. This will require a tunnel of about 900 yards, for passing the more elevated part of the ridge and deep cuttings at each end, to the extent of about two and a quarter miles in length, and about 20 feet average depth. Four shafts have been sunk on the line of this tunnel, for the purpose of ascertaining the precise nature of the strata through which it will pass; and I am happy to say that the result proves extremely favorable. The material at the level of the drift is a sand stone rock, of moderate hardness, which would be excavated in the open air for about 35 or 40 cents per cubic yard; and which, therefore, according to the analogy of such works, would not exceed one dollar and sixty cents in the drift, apart from the cost of



removing the rubbish. This rock is found to be of sufficient depth in the stratum to insure the stability of support without the assistance of masonry. The extreme height of the ridge above the line of the tunnel is 120 feet; but at the positions where the working shafts would be sunk, the height does not exceed 84 feet. A small proportion of rock excavation will be necessary in opening the deep cut at the east end of the tunnel; but on the west side, the rock disappears at the commencement of the deep cutting, and the length of the tunnel has been determined by this circumstance. A tunnel of such a length, and under such circumstances, cannot be regarded as a difficulty of very great magnitude; it probably will not be more expensive than a 48 feet cut of the same length in common gravelly loam. The remaining two miles of the middle division occupy the level flats of the Sandy below Hanover, and are wholly favorable. The feeders which should be noticed in connection with the summit division of the canal, are for the purpose of introducing the waters of the following streams, viz: Davis' Branch of Sandy, Mendenhall's do. Holland's do. and the main branch of the same, also, the West Fork of Little Beaver and Cold Run. Of these the two first will require a single feeder of about  $5\frac{1}{2}$  miles in length, the others either intersect the route, or lay contiguous to it, and may be introduced almost without expense. Should the purposes of trade be found to require a further supply, it is ascertained that a part of the waters of the Middle Fork of Little Beaver may be thrown into the summit level by an engine feeder, under circumstances singularly favorable, and at a very moderate expense. But of this I shall speak more particularly hereafter.

The Western division of the route continues down the valley of the Sandy to its mouth, and is  $33\frac{1}{2}$  miles in length from the first lock below Hanover, to the village of Bolivar, on the right bank of the Tuscarawas, where it intersects the line of the Ohio and Lake Erie Canal. No part of the route on this distance offers any impediment worthy of particular discussion. On the contrary, the fine open plains and gentle declivities by which the valley of Sandy is remarkably characterized, offer on a large part of it a choice of favorable locations;



and if it were not for the lockage, and the expediency of crossing the creek occasionally, in order to shorten the distance, the construction of this division would be reduced to a very low minimum indeed. The soil is generally a light species of gravelly loam, inclining to clay towards the head of the valley, and becoming somewhat more sandy westward: but though generally easy of excavation, it is no where so loose or light, as not to afford, with proper attention to the slopes, good and sufficient banks. The lockage amounts to about 223 feet, including one ascending lock at the junction of the Ohio line. Feed water is received from one or two tributaries of the Sandy and from the Sandy itself, as occasion requires; generally, however, at such points that the dams may also be used with advantage in crossing the stream. The dams are of moderate length, and do not exceed an average of  $4\frac{1}{2}$  feet in height. There are three crossings of this description, and three by means of aqueducts, including that across the Tuscarawas, at the termination of the line. A few instances of bluff bank occur on the location side near the mouth of the Sandy amounting to about three-fourths of a mile in all. These will require protection walls, or they may be secured by diverting the stream into a different channel.

The Eastern division of the line commences at the Eastern extremity of the summit level, and immediately descends by a rapid succession of locks, to the level of the Middle Fork of Little Beaver. It then follows the valley of that stream to its confluence with the Ohio, and up the right bank of the latter to the mouth of the Big Beaver, where it intersects the route of the Pennsylvania state canal. Its precise length will depend somewhat upon the ultimate location of the latter; pending which, it is considered as terminating at the end of the 43d mile, near the Beaver bridge.

The flight of locks mentioned at the commencement of this division, descends a ravine, of nearly uniform declivity and of convenient dimensions for all purposes of construction. The number of locks is 27, having an aggregate lift of 162 feet (6 feet each) in a distance of one and a half miles. This will afford intermediate basins of 186 feet length, which, by occupying rather greater width and depth than



usual, will be sufficient to make locks of this lift independent of each other. It may be observed, that locks under the circumstances and in the relative position here described, are frequently built with more convenience and at less expense than in the ordinary way; as by shelving down the bottom of the basins from lock to lock, the necessity of breast walls is entirely removed. In the present instance, it is another favorable circumstance, that the bottom of the ravine, on a considerable part of the descent, is composed of ledges of rock, which, while they furnish in part the material for the locks, will also afford an imperishable foundation for all the works. The foot of this flight of locks reaches the Middle Fork of Little Beaver, from which a feeder is taken, and the line then crosses immediately to the left bank. From this point, through the town of New-Lisbon, and to about five miles beyond, the location is extremely favorable, through a succession of meadows and river flats; but below this limit, the valley begins to assume a more bold and precipitous character, and on all the remaining distance to the Ohio, furnishes a very strong contrast to the flat, open topography of the Western division. This feature, however, is not without its advantages for the construction of the canal; as we are enabled by the narrowness of the stream, and the boldness of its banks, to dam it with the greatest facility, and thus form slack water pools, from 100 to 300 rods in length, in many places where the construction would be otherwise attended with considerable difficulty. About five miles are thus constructed in a distance of 19, reducing the labor of excavation to the mere formation of a tow path, in addition to the necessary dams; and it results, that the construction of the canal down this valley, rude and unpromising as it appears, is very little more expensive than the ordinary average of an open route. The employment of this mode of construction secures at the same time the necessary feed water for the use of the canal. In one instance only, a separate feeder is required for the purpose of leading the water of the North branch into a dam located on the main one, a little above the confluence. About two miles above this confluence, the line for the first time after leaving New Lisbon, crosses by a dam to the right



bank, and continues down that side to the mouth of the creek, where it re-crosses by an aqueduct. The continuation of the line, from this point to the mouth of Big Beaver, occupies the flats of the Ohio just sufficiently above the line of extreme high water to secure it from the freshets, the ground at this level being free from any great irregularities, and generally favorable in other respects. A basin is projected at the end of the 43d mile, in which the present location terminates; and in case the Pennsylvania canal should be located on the West bank of Big Beaver, which the reports on that subject seem to indicate as most probable, a few rods only of excavation will remain to complete the navigable connexion.

The total lockage on this division is 429 feet, including a rise of about 12 feet on the ascent of the Ohio. Having thus particularly described the whole route of the canal, properly so called, and exhibited the various local advantages and disadvantages, under which it will have to be constructed, I proceed next to examine the important question relative to the supply of water.

The interesting situation and relations of this canal, regarded as a connecting link between the state improvements of Ohio and Pennsylvania, give a high degree of interest to every question of this kind; and as some doubts have been expressed on this subject, it did not fail to engage early and particular attention. Soon after my arrival on the line, dams were constructed on all the principal streams of the summit level, that is to say: Davis' Branch of Sandy, Mendenhall's and Holland's Branches of the same, and the main branch below Hanover; also the West Fork of Little Beaver, and Cold Run. These dams were furnished with waste wiers of the proper shape and dimensions for gauging, and built with some degree of permanency, so as to afford a series of measurements, during the whole of the dry season. At the time of their construction, the streams were yet on the decrease, but on the 29th of August, when they appeared nearly to have reached their lowest limit, the weirs were measured, and found to yield an aggregate of 736 cubic feet per minute. On the 6th September, the drought, being still uninterrupted, the measurement gave 708 cubic feet, and the same on the 18th; but



about the first of October the waters began to rise, and by the 6th of the same month, the aggregate flow was upwards of 2000 feet per minute. From these measurements, and my own knowledge of the state of the water, previously to the 23th August, I have assumed the duration of extreme drought for the year 1828, at about seven weeks; and the average supply during that time at 722 feet per minute, being the mean of 736 and 708. This will appear a safe estimate, when we consider that the waters generally, before the 29th August, were higher than at that time, and that the average afterwards was also higher than at the times of measurement: for those measurements were always made after the longest interval of continuous drought, and when the streams were least affected by occasional rains, of which there were several instances in the course of the dry season. According to the best information that could be obtained, the streams had seldom, if ever, been seen as low as in 1828; but that there may be no room for doubt on this head, I suppose the duration of drought in general to be 60 days, instead of seven weeks, at the rate above mentioned, which will comprehend nearly the whole of August and September.

The summit level of the canal I propose constructing with an extra depth of three feet, which will make it a reservoir for about ten millions cubic feet of surplus water. This will enable us to secure the product of every shower during the summer, for the use of the canal, and being filled, of course, in the earlier part of the season, will afford us, even without any accessions of this kind, a regular supply of 114 cubic feet per minute, in addition to the preceding, during the whole 60 days. We may also estimate at least 50 cubic feet per minute, from the heads of Brush Run, and several other small but permanent spring streams, by which the line of the canal is intersected, and which are not included in the foregoing estimate.—The aggregate of the whole is 886 cubic feet per minute; we shall presently add to this the produce of an engine feeder from the Middle Fork of Little Beaver; but to show more clearly the grounds of certainty upon which this canal may be undertaken, let us first in-

quire how far this supply alone, without any such addition, would meet the expectations of public convenience and revenue.

In the first place it will have to supply the losses of soakage and evaporation on about twenty miles of the canal. The soil of a considerable portion of this distance is a strong clay, in which very little water can be lost by soakage; and even the most unfavorable parts contain so considerable a mixture of clay, that, with a very little care in the construction, they may be rendered nearly water tight. Under these particular circumstances, I consider 22 cubic feet per mile per minute, as entirely sufficient for the supply of these losses on the Middle division; which gives a total of 440 feet for the 20 miles.— One hundred and twenty cubic feet per minute, must then be allowed for leakage and waste at the gates; which with the former, being deducted from the total supply, leaves 326 cubic feet per minute, for the purposes of lockage, or 234,720 cubic feet per diem, at each end of the summit level. The locks are of six feet lift, 15 by 90, and contain 8,100 cubic feet; this quantity, therefore, will afford nearly 29 locks full, and as three locks full will generally pass four boats, in the average order in which they present themselves, we have a navigation of  $38\frac{1}{2}$  boats per diem from the supply in question. This seems a very moderate number; but let us examine it a little further; and first with reference to the question of revenue. Thirty eight and a half boats per diem, during the summer months, correspond, according to the ratios furnished us by the New York canal, with an aggregate of 10,000 boats per annum; and if we suppose an average cargo of 25 tons, (the burden of the boat being full 50,) we shall have a total of 250,000 tons, and a toll, at one cent per mile per ton, of \$226,250 per annum, or nearly 18 per cent. on the whole cost of the canal. Let us examine it with reference to public accommodation. At Rochester on the New York canal, the average number of passages per diem, during the months of August and September, 1828, was about 27, and from circumstances communicated in the last report of the commissioners, I infer that it must have been even less than 24 during the past season; the probable mean is about one half less than the number which could have



been passed during the same months, on the Sandy and Beaver canal, with only the natural supply of water on the summit; and if we admit the trade of Rochester to be a fair term of comparison, it does not appear probable that the business of the Sandy and Beaver canal will immediately require a larger supply than this. That it may do so, however, in the course of a few years, is by no means unlikely. Its object is to connect the trade of the Ohio canals, by a direct route with Pittsburgh and Philadelphia, and ultimately, perhaps, with Baltimore and Washington; and if we may infer an increase of trade, corresponding in any degree with the advancement of population and public wealth in the state of Ohio, the time is not distant when other supplies will be called for. In this case, we look to the Middle Fork as already suggested, and I now proceed to show the manner and probable expense of obtaining any required addition of feed water from this stream.

The point at which it is proposed to take it out, is 68 chains from the line of the summit location, opposite the end of the second mile, and 125 feet below the ground rising immediately from the edge of the creek to the level of the line. A few yards from the water, and near the level at which the steam engine would be placed, a rich vein of bituminous coal breaks out, and shows itself with a thickness of about three feet, to a considerable distance up and down on both sides of the creek. This coal has been wrought to some extent at the furnace a short distance below, and it is fully ascertained that it may be delivered at the mouth of the pit at one and a half cents per bushel.

I have estimated it at two cents delivered at the engine, which makes the cost of fuel only four dollars for an engine, consuming 200 bushels per diem.

The total cost of a feeder, deriving its supply by an engine of this power, kept in perfect repair, and working at the rate of ten weeks per annum, may be estimated as follows:

D

For the engine and the necessary buildings,	\$10,000 00
250 yards main pipe, at 24 dollars,	6,000 00
1,200 yards wooden leader, 4 dollars,	5,000 00

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Total first cost,	\$21,000 00
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Fuel as above at 4 dollars per diem, ten weeks,	\$280 00
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Wear, tear and attend- ance, at 5 dollars,	350 00
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Total annual expense,	\$630 00
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Say 700 per annum, equivalent to an invest- ment of	\$10,000 00
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Total capital,	\$31,000 00
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The performance of the engine will depend upon its construction. This is differently estimated by different engineers. According to the performance of the Cornwall engines in 1815, an engine consuming 200 of English coal per diem, would raise about 400 cubic feet per minute to the height required; but from the work of the engines of the same district, in 1828, such an engine would raise no less than 670 cubic feet.

Taking the mean of these results, and making a reasonable allowance for any supposed difference in the quality of the coal, I get 460 cubic feet per minute, by way of estimate, for the performance of the engine in question, which is also a fair estimate from the working powers of several engines in our own country. This will increase the quantity of lockage water from 326 to 786 feet per minute, and the capacity of the canal from 38½ boats per diem, to 93 boats. A trade to this extent, during the summer months, according to the ratios heretofore quoted, corresponds to a navigation of 24,111 boats per annum, (almost double the number of arrivals and departures at Albany during the past season) and an aggregate toll of 542,400



dollars. These calculations are made upon practical grounds, and with liberal allowances on all points which involve any doubt. It may be satisfactory to some, however, to know that in case of necessity, the Middle Fork could easily spare 3 or 400 feet more, without prejudice to the supply of the Eastern division.

The summit level being thus provided for, there can be no doubt of the sufficiency of water on every other part of the canal. On the Western division, some additional supplies will be gained at the dam below the lock, No. 7, which with the small streams intersected by the line below, will be more than sufficient for the soakage and evaporation to Pekin. Below Pekin, and after taking in Hugill's Run, there will be surplus sufficient to admit an increase of two or three feet in the lift of the locks; and finally, from Waynesburgh down, the locks may safely be constructed, if necessary, with lifts of ten feet. On the Eastern division, there will be a sufficiency for 10 feet locks, immediately after taking in the first feeder from the Middle Fork above New Lisbon; and from that point down, locks of 9 and 10 feet, may be used without fear, so far as water is concerned. It only remains now to add a few remarks on the construction of the works, and the scale of prices preparatory to the estimate.

The connection of this canal with the canals of Ohio and Pennsylvania, (both modelled after the New York canal) indicates, at once, the tonnage of the boats to which it should be adapted, and the size and proportion of all the works. Accordingly the section of the canal has been assumed at 40 feet surface, 28 feet bottom, and 4 feet deep, and the locks at 90 feet by 15. The profile of the summit level only, is varied as already suggested, so as to admit a depth of 7 feet instead of 4. The tunnel is projected with a transverse section of 30 square yards, except two recesses of the length of 75 feet each, which are enlarged to 50 square yards, making an average of  $33\frac{1}{2}$  on the whole length of the drift. This goes upon the supposition, that the tow path is discontinued through the opening. It could not be retained without an additional expense of 15 or 16 dollars per yard run; and its use may easily be supplied by an endless chain, and stationary horse power, for less than one-tenth that

amount. The feeder from Davis' Branch, it is proposed to construct of wood. It will not differ much in point of expense from an excavated feeder, and will have greatly the advantage in retaining the water. The dams, generally, are supposed to be built in the usual way, of timber, filled in with stone and gravel; the aqueducts with trunks of wood; and abutments and piers of masonry. Good materials for masonry are found every where, within a short distance of the line and in many places where the most expensive constructions are required, the best of building stone occurs on the spot. With these advantages, the locks and other works of masonry would probably be executed at less expense (perch for perch) on this line, than on canals generally; but as many of the locks are of moderate lift, and on that account somewhat more expensive in the gross, I have estimated them at 600 dollars per foot throughout, which is a very liberal average of the lock contracts on the Pennsylvania canals. Other works are estimated by a scale equally safe: as for instance, excavation of earth, generally from 7 to 10 cents, and in deep cutting, as high as 16; rock, in ordinary situations, 35 to 50 cents; in the shafts of the tunnel, \$1,25, and in the drift of the tunnel 2 dollars; embankments, 10 to 15 cents; dams across small streams, and of moderate elevation, 4 to 9 dollars per foot; those of greater height, 15 to 25 dollars; aqueducts, 35 to 50 dollars per foot run; tow path bridges, farm and road bridges, and culverts, according to the prices on the western division of the Pennsylvania canal.

The aggregate result per mile, is exhibited in the following *summary estimate*, together with the causes of extra expense, whenever they occur:

### Middle Division,

MILE 1.	Extra cutting, part rock	\$10,355 14
2,	do. do.	10,346 16
3.	Fair	2,366 40
4.	do.	2,052 68
5.	Ordinary	5,082 30
6.	do.	4,855 90
7.	Embankments	12,015 50



8. Deep cutting, part rock	39,351 92
9. Extra cutting, part rock	12,205 54
10. do. do.	7,361 85
11. 924 yds. tunnel, at \$78 50, and deep cut	112,403 18
12. Deep cutting	37,902 80
13. Extra cutting in part	8,544 20
14. Fair, feeder from Davis' Branch	21,815 34

Total, Middle Division,

\$286,658 91

### Western Division,

Mile 1. Fair	2,979 92
2. do.	2,691 06
3. do.	2,582 44
4. do.	2,535 76
5. Dam and guard lock and turnpike bridge	7,633 16
6. Fair	2,530 78
7. do.	4,209 64
8. do.	3,054 84
9. Aqueduct	12,221 02
10. Fair	3,092 48
11. Feeder at Pekin	4,179 96
12. Fair	3,516 64
13. do.	3,622 32
14. do.	4,879 36
15. do.	4,636 04
16. do.	2,822 80
17. do.	3,575 56
18. Dam and guard lock, Waynesburgh	9,441 20
19. Fair	3,822 27
20. do.	3,090 88
21. do.	4,231 03
22. do.	2,654 72
23. do.	3,145 04
24. do.	2,912 48

25. do.	3,883 72
26. do.	4,729 17
27. Dam and guard lock at Sandyville	13,195 22
28. Fair	4,776 16
29. do.	4,535 54
30. do.	4,082 64
31. Aqueduct and extra cutting, part rock,	24,988 70
32. Fair	2,910 10
33. do.	3,989 52
Half mile fraction crossing the Tuscarawas	20,758 68
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	188,510 85
222,66 feet lockage, at \$300	133,596 00
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Total, Western Division,

\$322,106 85

**Eastern Division.**

Mile 1. Embankment	9,839 36
2. do. and aqueduct	7,550 84
3. Fair	4,191 78
4. do.	3,699 94
5. do.	3,057 85
6. do.	2,614 04
7. do.	2,511 76
8. do.	4,641 02
9. Slack water in part	3,415 40
10. Dam and guard lock	11,076 64
11. Fair	3,457 38
12. Embankment and sideling	8,029 36
13. do. do.	5,380 12
14. Fair	3,612 72
15. Slope Wall	7,582 52
16. do. and extra embankment	11,069 92
17. Fair, sideling in part	5,146 27
18. Dam and guard lock	9,468 24
19. Sideling	5,559 56



20. Dam and guard lock	9,208 44
21. Fair	2,800 00
22. Dam and guard lock, and feeder from ) North Branch )	11,903 44
23. Fair	2,676 40
24. Dam and guard lock, extra rock, &c.	15,679 56
25. Undulating	4,620 36
26. Dam	8,608 98
27. Fair	3,024 66
28. Slack water	4,490 00
29. Dam and guard lock, extra embank- ) ment and aqueduct )	33,167 36
30. Aqueduct	6,927 56
31. Undulating	4,012 24
32. do.	4,512 26
33. Fair	3,024 17
34. Ordinary	5,803 70
35. Fair	3,458 00
36. Extra embankment	5,114 40
37. Extra cutting	4,347 76
38. Fair	2,870 89
39. Extra cutting	4,940 76
40. Protection wall	4,836 28
41. Embankment and aqueduct	7,370 41
42. Slope wall	9,304 40
43. Fair	3,196 52
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	277,802 77
429 feet lockage at \$600	257,400 00
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Total, Eastern Division,	\$535,202 77
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**General Summary.**

Middle Division	14 miles	286,658 91
Western Division	33½	322,106 85
Eastern Division	43	535,202 77

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Nett total 90½ miles \$1,143,968 53

Engine feeder 31,000 00

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1,174,968 53

Contingencies, 10 per cent 117,496 85

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Grand total, \$1,292,465 38

In conclusion, allow me to observe that the efficient manner in which Mr. Malin has discharged the duties confided to him, entitles him equally to my acknowledgments and the commendations of the Board. All which is respectfully submitted.

**D. B. DOUGLASS,**

*PROFESS. ENG. U. S. MILITARY ACADEMY.*

WEST POINT, Feb. 1, 1830.



## Instructions to Engineers.

OFFICE OF THE SANDY AND BEAVER CANAL }  
COMPANY, SEPTEMBER 10, 1834. }

TO MESSRS. E. H. GILL AND H. HAGE.

GENTLEMEN:—

That a clear and definite understanding may exist between you and the Board of Directors of the Sandy and Beaver Canal Company, in reference to the nature and extent of the services you are expected to perform in the examination of the Route of the Sandy and Beaver Canal, the undersigned who were appointed by the Board for that purpose, deem it not improper to address you on the subject, with a view to accomplish that object. As the necessary supply of water upon the summit level, for an active navigation, presents itself as a highly important question, it is expected that you will ascertain the natural supply of all the streams that do, or can be brought to flow upon that portion of the line, and state your opinions whether that supply alone will be sufficient during the whole year. If you cannot confidently rely upon that supply, we desire you to ascertain whether there are any sites suitable for the construction of reservoirs; and if there are, you will be pleased to report what number, where located, of what capacity, by what streams they are to be filled, and the extent of country drained; the probable expense of construction, and how far they will be the means of supplying the apprehended deficit, with your opinions of the amount of tonnage, or number of boats that may be passed per day.

It is further desirable that you should state the comparative height of the top-water line of the Canal, with the surface of the adjoining country on either side, and to what extent losses may be apprehended by leakage and soakage, taking into view the peculiar location of the line, and the capacity of the soil for retaining water, and how far those losses may be compensated by the interception of spring streams in its excavation, exclusive of the streams relied upon for a supply.

In conclusion, should you find a sufficient supply of water upon the summit level for an extensive commerce, it is the desire of the Board of Directors that you should make a reconnoissance of both the eastern and western divisions of the line, and give your opinions in regard to its location and probable supply of water: as well as all other matters that may suggest themselves to your minds, that would have an important bearing upon the subject.

BENJAMIN HANNA, }  
ELDERKIN POTTER, } COMMITTEE.

## The Report of Messrs. Gill and Hage on the Sandy and Beaver Canal.

TO THE PRESIDENT AND DIRECTORS OF THE SANDY AND BEAVER CANAL COMPANY.

GENTLEMEN:—

In compliance with instructions received from a committee of your Board, dated September 10th, 1834, we have examined the Route of

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the Sandy and Beaver Canal, with a view to the adequacy of the supply of water for an active navigation, and respectfully

### **REPORT:**

The Summit of the Canal drains eighty square miles of country, and is fourteen miles in extent, ten miles of which are located over ground exceedingly favorable for the retention of water—being a tough clay, mixed with a small portion of gravel. The top water-line of the Canal is depressed to a plane, lower than the surface of the adjoining country, and as the cutting is deep, and the ground gradually rises as it recedes from the line, no allowance can be requisite for losses by leakage. This portion of the route is frequently intercepted by small, but durable streams, and the soil being extremely springy, there is every reason to believe, that it will afford an ample supply for all losses that can possibly be sustained by evaporation. The remaining four miles of this, and three on the adjoining levels, dependent on the summit for their supply, are of a character somewhat different, and will require some allowance for leakage and evaporation.

The summit will receive its natural supply of water from Cold Run, Brush-Run and West Fork of Little Beaver Creek, Sandy Creek, Holland's Creek, Mendenhall's Run and Davis' Branch; in addition to which, the head waters (the East and West Forks) of the Mahoning can be conducted into it at a moderate expense.—These streams were frequently & accurately gauged, at their lowest stages, during the last month, and were found at their minimum, to yield in the aggregate 558.49 cubic feet per minute. As this amount is much less than that found by Major Douglass, during his examination in 1823, we are led to infer from it, and our own observations, as well as the information received from the inhabitants, that the past season has been one of unusual drought, and that in ordinary seasons, a much larger supply may with safety be calculated on. The land in the vicinity of this portion of the Canal, and the streams enumerated, is already much improved; and we feel safe in estimating the complemeut now cleared at fifty per cent., therefore little diminution in the streams is hereafter to be apprehended, from the hand of the settler; and we feel fully jus-



tified in assuming that the amount of water now found, will in future prove to be the minimum supply.

Allowing 60 cubic feet per. mile per minute, to meet the loss by evaporation and leakage, on the seven miles heretofore described, we have left for the purpose of navigation 138.49 cubic feet per minute, which would amount to 198,425 cubic feet per day. The summit level being located to contain seven feet in depth, we have 3 feet of surplus water for lockage, which would afford in addition to the above, 100,000 cubic feet per day, for one hundred days, which we assume as the period of the greatest probable drought—making in the whole 298,425 cubic feet per day, during the dry season. If from this amount we deduct 86,400 cubic feet per day, for loss and leakage at the locks, we have left 212,025 cubic feet per day for lockage—being sufficient for the transit of 17,45 boats per day across the summit, allowing that the locks have a lift of six feet, and that three locks full will pass two boats.

This amount being inadequate to accommodate the trade that may be anticipated, it becomes necessary to resort to reservoirs, which, during the dry season, will supply the deficiency. Numerous and eligible sites for this purpose, present themselves, the most favorable of which, are on the West Fork of Little Beaver Creek, and Cold-Run. The first of these will flood 300 acres, and contain 105,937,920 cubic feet of water, having an average depth of 8,10 feet above the highest plane of the summit level. The other is intended as an auxiliary to connect with the former, by means of a short feeder—will inundate about 96 acres, and contain 33,711,680 cubic feet of water—having an available average depth of 8,06 feet, amounting in all to 139,649,600 cubic feet. If from this amount, we deduct twelve inches in depth for evaporation, &c. we shall have left for navigation 124,943,744 cubic feet—being sufficient to pass 102,83 boats per day; this added to the 17,45 boats per day in the foregoing statement, gives a supply sufficient to accommodate over 120 boats per day, during the dry season.—The estimated cost of constructing these reservoirs, and the Mahoning feeders, is as follows:

## WEST-FORK RESERVOIR.

68,000 cubic yards embank-		
ment, at	20 cts	\$13,600
500 linear feet of		
pipe at	5,40	2,700
672 perches of		
wall at	2,00	1,344
200 " "	3,00	600
Sluice gates &c. &c.		1,000

\$19,244 00

## COLD-RUN RESERVOIR.

12,684 cubic yards		
feeder excavation		
at	8 cts	1,014 72
47,000 cubic yds.		
embankment " 16		7,520 00
214 linear feet		
of pipe at	5,40	1,155 60
400 perches of		
wall at	2,00	800 00
200 perches at	3,00	600 00
Sluice gates, &c.		500 00
Waste weir in feeder		150 00

11,740 32

## MAHONING FEEDER TO WEST-FORK.

24,700 cubic yds.		
excavation at	12 cts	2,964 00
9,000 cubic yds.		
embankment at 15		1,350 00
Waste wier		200 00

4,514 00

## MAHONING FEEDER TO DAVIS' BRANCH.

85,700 cubic yds.		
excavation at 12 cts		10,284 00
27,000 cubic yds.		
embankment at 15		4,050 00
Bridge at deep cut		150 00

14,484 00

Add 10 per cent for contingencies

49,982 32  
4,998 23

Total estimated cost

\$54,980 55

The streams on which the above described reservoirs are situated, in connection with the East-Fork of Mahoning, afforded during our recent examinations, at their minimum discharge, 249 cubic feet per minute, and drain about twenty-four square miles of



country; during nine months of the year they will yield an average discharge of 1048 cubic feet per minute, *independent of freshets*. These reservoirs, from the extent of country they will drain, compared with works of similar character elsewhere, will require no other supply to fill them, *than the floods* of the streams on which they are located: so that we can with safety rely on having for lockage, at all times, excepting the one hundred days of dry weather, a natural average flow of 1048 cubic feet per minute from the streams last mentioned.—In addition to this, the other streams heretofore enumerated, will yield during nine months of the year, an average amount of 1522 cubic feet per minute, making in the aggregate 2570 cubic feet of water per minute—sufficient to accommodate a trade of 295 boats per day.

While on the subject of reservoirs, it may be proper to state, that such a resort for supplying canals with water is by no means experimental. Some of the canals in Europe as well as in our own country, derive a large portion of their water from reservoirs. On the Shaws water works in Scotland, they have been able to lay up in their reservoirs, from the drainage of about five and a half square miles of country, 284,678,550 cubic feet, being over 70 per cent. of the annual rain that falls on that surface. But we need not extend our researches beyond the works already constructed, in your own vicinity. Upwards of twenty miles of the Licking summit of the Ohio Canal, receives its entire supply from a reservoir, notwithstanding the extreme drought of the past summer, which for many weeks dried up the streams that usually flow into it, the reservoir has been found to furnish an ample quantum of water for all the exigencies of the trade.

Although the reservoirs above alluded to are fully adequate to meet the demands of an extensive navigation, it may be remarked that during our explorations, other sites were examined. Two of these were surveyed, one on Mendenhall's Branch of Sandy Creek was found would contain thirty-two millions cubic feet of water, and flood eighty acres of land. The other on Davis' Branch of the same stream, would inundate two hundred and fifty acres, and have capacity to retain one hundred and nine millions cubic

feet; both these can be constructed at a moderate expense.—Hahn's Branch of Sandy likewise, offers a very eligible site for a cheap & capacious reservoir, the water of which could be conducted into the summit, by a feeder connecting with that from Davis' Branch. On Brush-Run, several basins might be formed at a small expense, which during the rains would collect large quantities of water.—The Middle Fork of Little Beaver Creek was also examined, and found at its lowest state to gauge 1200 cubic feet per minute, at Dale Furnace.\* Should it be thought expedient to resort to it as a feeder in preference to Reservoirs 800 cubic feet per minute could be taken from it, without detriment to the Eastern Division of the line. This amount of course, must be elevated to the summit by steam. The cost of an engine or engines, of sufficient power for the purpose, together with the requisite buildings, pipes, feeders, dams, &c. would not exceed \$29,000, and could be kept in full operation for less than \$20 per day.

#### THE EASTERN DIVISION

of the Canal descends rapidly from the summit level, for about one mile and a half, when it enters the valley of the Middle Fork of Little Beaver Creek.—This stream affords at all seasons an ample supply of water to meet the demands of leakage, evaporation and lockage, and as it approaches the Ohio River, the flow is greatly augmented. The valley of the stream offers eligible sites for the construction of dams, and from its general formation is well adapted to the purpose of slack-water navigation. Should the Canal be extended up the Ohio River, it will be fully adequate to its wants.

#### ON THE WESTERN DIVISION

of the line, a portion of the levels near the summit or Middle Division, will require to be fed from the upper level. Loss by leakage and evaporation on this portion, has been accounted for in our foregoing calculations.

The valley of Sandy Creek, thro' which this division is located, is

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\* Dale Furnace is the point where the canal in its descent from the summit, first intersects and receives as a feeder, the Middle Fork of Little Beaver.



peculiarly favorable for the construction of a canal. From the numerous streams that intersect the creek in its meanderings, there can be no doubt as to the abundance of the supply of water for this division.

The country through which the whole line passes, offers in general, facilities for the construction of the work in question that are not usually met with. Timber and stone of a superior quality, are found in abundance. Hydraulic lime is frequently met with, and we have no hesitation in saying, that the improvement can be constructed, at a moderate cost compared with works of a similar extent.

All which is respectfully submitted.

**E. H. GILL,**  
**HOTHER HAGE,** } **Engineers.**

*New-Lisbon, October 13, 1834.*

### Letters of Recommendation.

*STATE OF GEORGIA,* } *January 31st, 1829.*  
*City of Savannah;*

This is to certify that E. H. Gill, civil engineer, has been employed by the Savannah Ogeechee and Alatomaha Canal Company for the last two years, (except occasional absence during the sickly season) as assistant and principal engineer, and has given entire satisfaction to the Company whilst in their service.

*By order of the Board of Directors.*

ALEX. TELFAIR, *President.*

[SEAL.] W. H. STEWART, *Treasurer and Secretary.*

*New-York, May 29th, 1832.*

To E. H. GILL, Esq.

DEAR SIR:—Your favor of the 25th asking me to say what I think right in regard to your skill as an engineer, I have just received, and can freely say that since the last of 1824 or beginning of 1825, when you first came to work as an engineer under me, I found your skill and judgment such as gave me great satisfaction while you continued with me, and since that time wherever I have known you engaged for others. I have heard your skill and good judgment as an engineer well spoken of and highly approved. I can say freely, that I consider you as possessing skill, integrity and industry, which are worthy of any trust confided to any engineer; and I can speak freely, and without reserve on this subject.

E. H. GILL, Esq.

Very truly your ob't.  
BENJAMIN WRIGHT.

*Office of the Schuylkill Navigation Company,* }  
*Philadelphia, August 23d, 1834.* }

GENTLEMEN:—E. H. Gill has been employed several years by this Company, as their engineer and has enjoyed the entire confidence of the Board. The individual opinions expressed to you this morning, by the members of the board, it is but justice to Mr. G. to state to you in



writing. Mr. Gill's opinions as an engineer, are, we believe, entitled to the fullest confidence, and his Report to you upon the subject of your inquiry as to the adequacy of the supply of water to be obtained for your Beaver and Sandy Canal, would in our opinion be entitled to as much weight as that of any other engineer whatever. His accuracy, judgment and caution will not permit him to make a Report without full belief in its correctness. I am yours, respectfully,

JOSEPH S. LEWIS, *President.*

TO BENJAMIN HANNA & ELDERKIN POTTER, ESQRS.

The subscribers, members of the Board of the Schuylkill Navigation Company, fully agree with the president, Joseph S. Lewis, in his opinion of the qualifications of Edward H. Gill.

MANUEL EYRE,	JOHN SERGEANT,	THOS. FIRTH,
JOS. T. MATAER,	CHAS. H. BAKER,	L. NICHOLSON,
HENRY TROTH,	JOHN BOHLE,	EDMUND WILCOX.

*Harrisburgh, October 4, 1834.*

I became acquainted with Mr. Hother Hage in 1827. He then came to the Susquehanna division of the Pennsylvania canal, as assistant engineer to Mr. Guilford, with whom he had been engaged, as I understood, under the direction of Mr. Canvass White, on the Union Canal. He has since been engaged most of his time, in the capacity of an engineer, on canals and rail roads, either exploring or executing. I have full confidence in his ability and integrity to serve any Company satisfactorily. Indeed I should hardly know where to point to a superior, who is now disengaged.

C. MOWRY, *Late acting Canal Com. Pa. Canal.*

*Harrisburgh, October 4th, 1834.*

The undersigned have been acquainted with Hother Hage, engineer, for several years. Mr. Hage has been employed as a practical engineer on the Pennsylvania improvement for several years. He is spoken of as a safe and experienced public agent, and one who stands high in his profession. We feel confident in recommending Mr. Hage to the notice of the public.

DANIEL STURGEON, *Auditor General,* A. MAHON, *State Treasurer,*  
S. WORKMAN, *Sec'y of Land Office,* J. SPANGLER, *Survey. Gen.*

*To the Directors of the Sandy and Beaver Canal, in the state of Ohio.*

GENTLEMEN:—Mr. H. Hage has requested me to address a line to you, approbatory of his character and qualifications as an engineer. With this request I most cheerfully comply. Mr. H. has been long employed upon the public improvements of this state, in the capacity of a principal assistant engineer; and although in the location and projection of work, he has not been a principal, yet with his present stock of experience, and my knowledge of his capacity, I have no hesitation in recommending him as being now qualified to perform well the duties of a principal engineer, in the location and construction of a canal. As a man, his honesty and integrity may be fully relied upon.

JOHN MITCHELL, *Canal Com. Pa. Canal.*

*Harrisburgh, Pa. Oct. 13th, 1834.*